Name ______________________ Date ________

9.2 Notetaking with Vocabulary

Success Criteria

I can solve quadratic equations by graphing
I can approximate the solutions of quadratic equations.
I can solve real-life problems by solving quadratic functions.

Write the meaning of each vocabulary term.

quadratic equation - a nonlinear equation that can be written in the form $0 = ax^2 + bx + c$ where $a \neq 0$.

What is the method for solving quadratic equations that you already know? Factoring.

1. Set $=0$.
2. Factor: a) standard form
   b) GCF/-1
   c) Special patterns
   d) ac/ box method
3. Set factors $= 0$ and solve.

Solving Quadratic Equations by Graphing

Use when approximate solutions are ok.

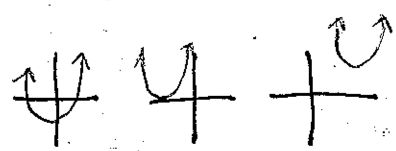
Step 1 Write the equation in standard form $0 = ax^2 + bx + c$

Step 2 Graph the related function $y = ax^2 + bx + c$

Step 3 Find the x-intercepts.

The solutions/roots, of $ax^2 + bx + c = 0$ are the x-intercepts of the graph.

Number of Solutions of a Quadratic Equation



A quadratic equation has:

- 2 real solutions when the graph of its related function has 2 x-intercepts.
- 1 real solution when the graph of its related function has 1 x-intercept.
- No real solutions when the graph of its related function has no x-intercepts.

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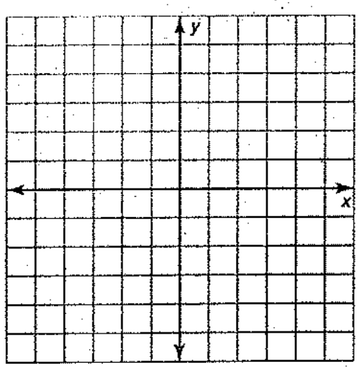
Examples

In Exercises 1–9, solve the equation by graphing.

1. $x^2 + 4x = 0$



4. $-x^2 + 5x - 4 = 0 = y$

$a = -1 \quad b = 5 \quad c = -4$

$x = \frac{-b}{2a} = \frac{-5}{2(-1)} = \frac{5}{2} = 2.5$

$y = -(2.5)^2 + 5(2.5) - 4$

$y = 2.25$

$(2.5, 2.25)$

$f(2.5) = 2.25$

Guess $x = 1$

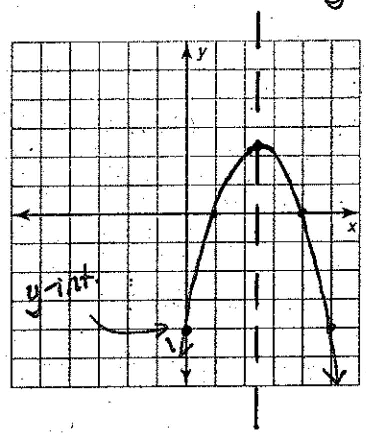
$-(1)^2 + 5(1) - 4 = y$

$-1 + 5 - 4 = y$

$0 = y$

$(1, 0)$

$\boxed{x = 1 \quad x = 4}$



4. $x^2 + 6x + 9 = 0 = y$

$a = 1 \quad b = 6 \quad c = 9$

AoS $x = \frac{-b}{2a} = \frac{-6}{2} = -3$

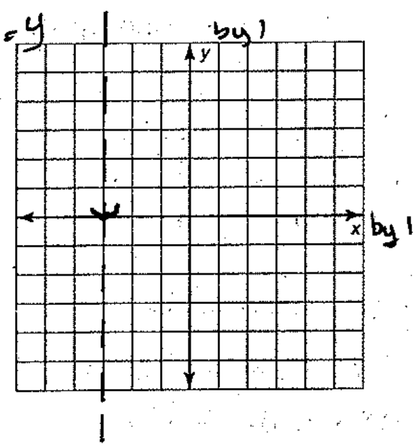
$(-3)^2 + 6(-3) + 9 = y$

$9 - 18 + 9 = y$

$0 = y$

$(-3, 0)$

$\boxed{x = -3}$



5. $x^2 = 2x - 6$

Method 1

$y = x^2 - 2x + 6 = 0$

$a = 1 \quad b = -2 \quad c = 6$

$x = \frac{2}{2} = 1$

$y = (1)^2 - 2(1) + 6$

$y = 1 - 2 + 6$

$y = 5$

$(1, 5)$ vertex

$\boxed{\text{No solution}}$

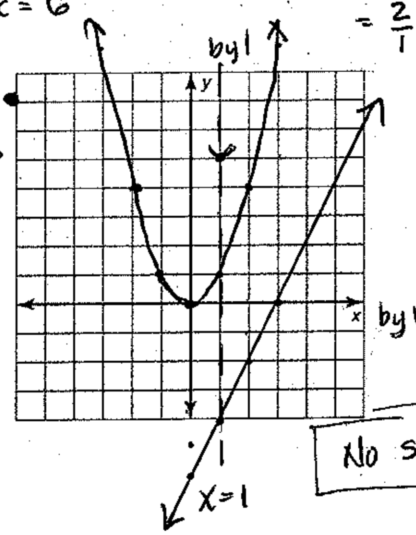
Method 2

x	y
0	0
1	1
2	4

$y = x^2$

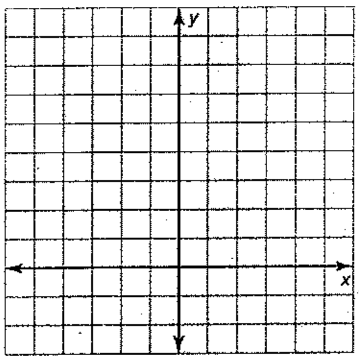
$y = 2x - 6$

$= \frac{2}{1}x - 6$

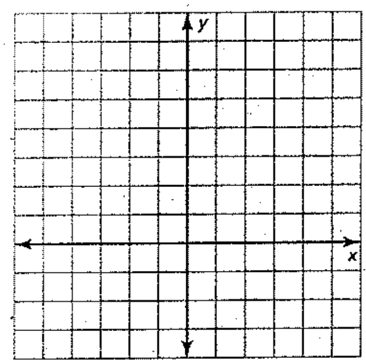


$\boxed{\text{No solution}}$

7. $x^2 + 4 = 0$

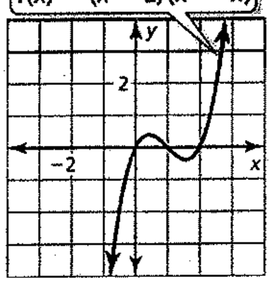


8. $-x^2 = 4x - 6$

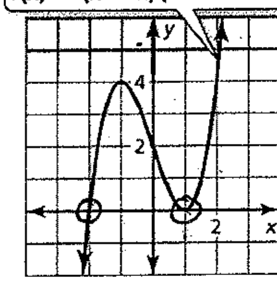


In Exercises 10–15, find the zero(s) of f. Check your solutions.

10. $f(x) = (x - 2)(x^2 - x)$



11. $f(x) = (x + 2)(x^2 - 2x + 1)$



$x = -2 \quad x = 1$

$f(-2) = 0 \stackrel{?}{=} (-2+2)((-2)^2 - 2(-2) + 1)$

$0 \stackrel{?}{=} (0)(4+4+1)$

$0 \stackrel{?}{=} (0)(9)$

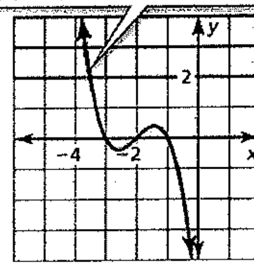
$0 = 0$ ✓

$0 = (1+2)(1^2 - 2(1) + 1)$

$0 = (3)(0)$

$0 = 0$ ✓

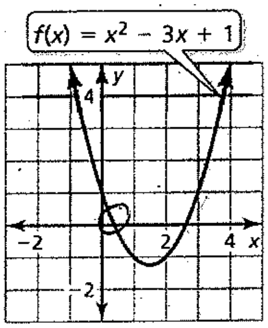
12. $f(x) = (x + 3)(-x^2 - 3x - 2)$



The zeros of a function are not necessarily integers. To approximate zeros, analyze the signs of function values. When two function values have different signs, a zero lies between the x-values that correspond to the function values.

In Exercises 16–18, approximate the zeros of *f* to the nearest tenth.

16.

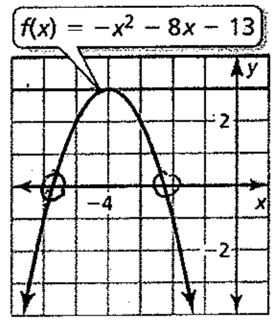


$x \approx .4$

$x \approx 2.6$

17.

18.



$x \approx -5.8$

$x \approx -2.2$

gravity

V_0 = initial velocity

S_0 = starting

A football player kicks a football 2 feet above the ground with an initial vertical velocity of 75 feet per second. The function $h = -16t^2 + 75t + 2$ represents the height (in feet) of the football after it is kicked. (a) Find the height of the football <u>each second</u> after it is kicked. (b) Use the results of part (a) to estimate when the football hits the ground.